Erosion & Deposition

Objectives

Students will be able to:

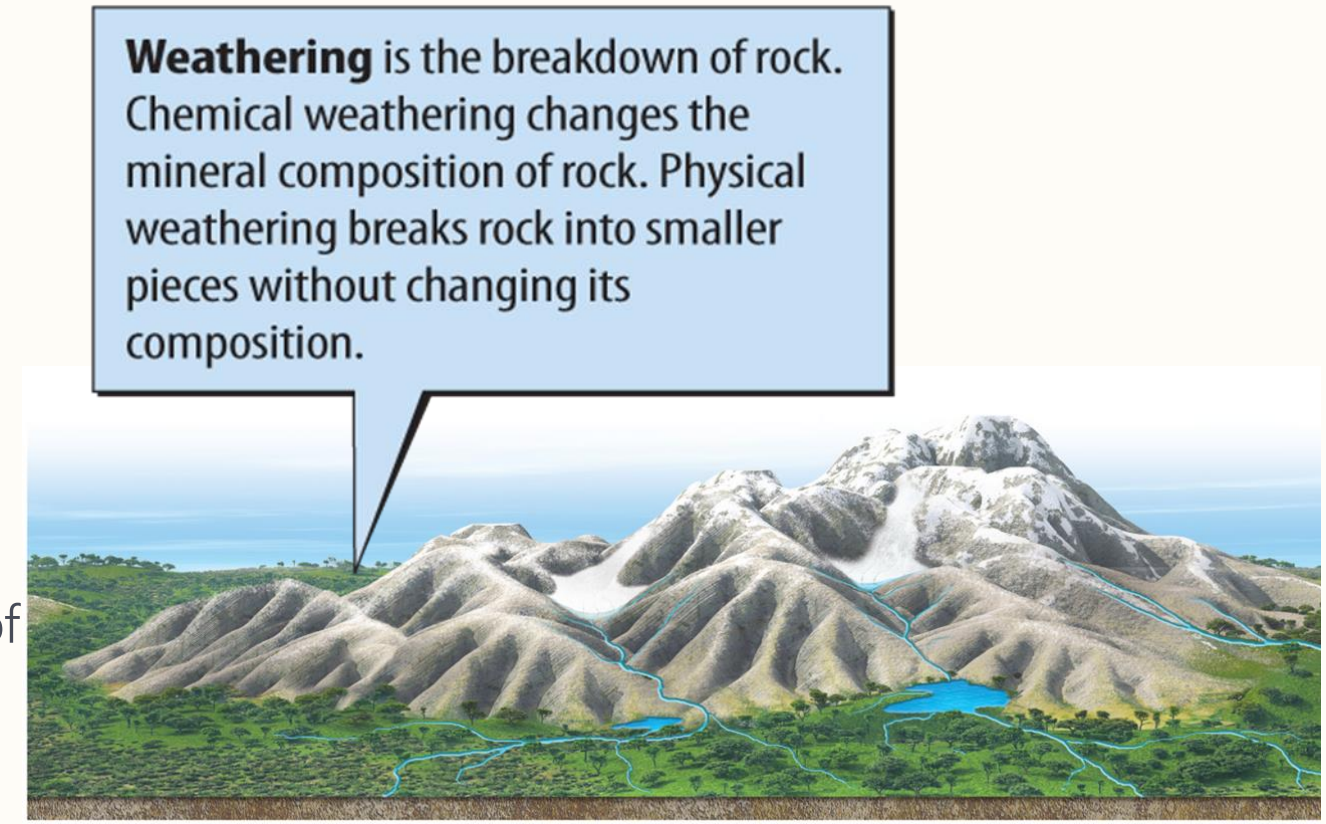
- Differentiate between weathering, erosion, and deposition.
- Explain how erosion and deposition are related.

Weathering

- A combination of constructive processes and destructive processes produce landforms.
- Constructive processes build up features on Earth's surface.
- Destructive processes tear down features on Earth's surface.

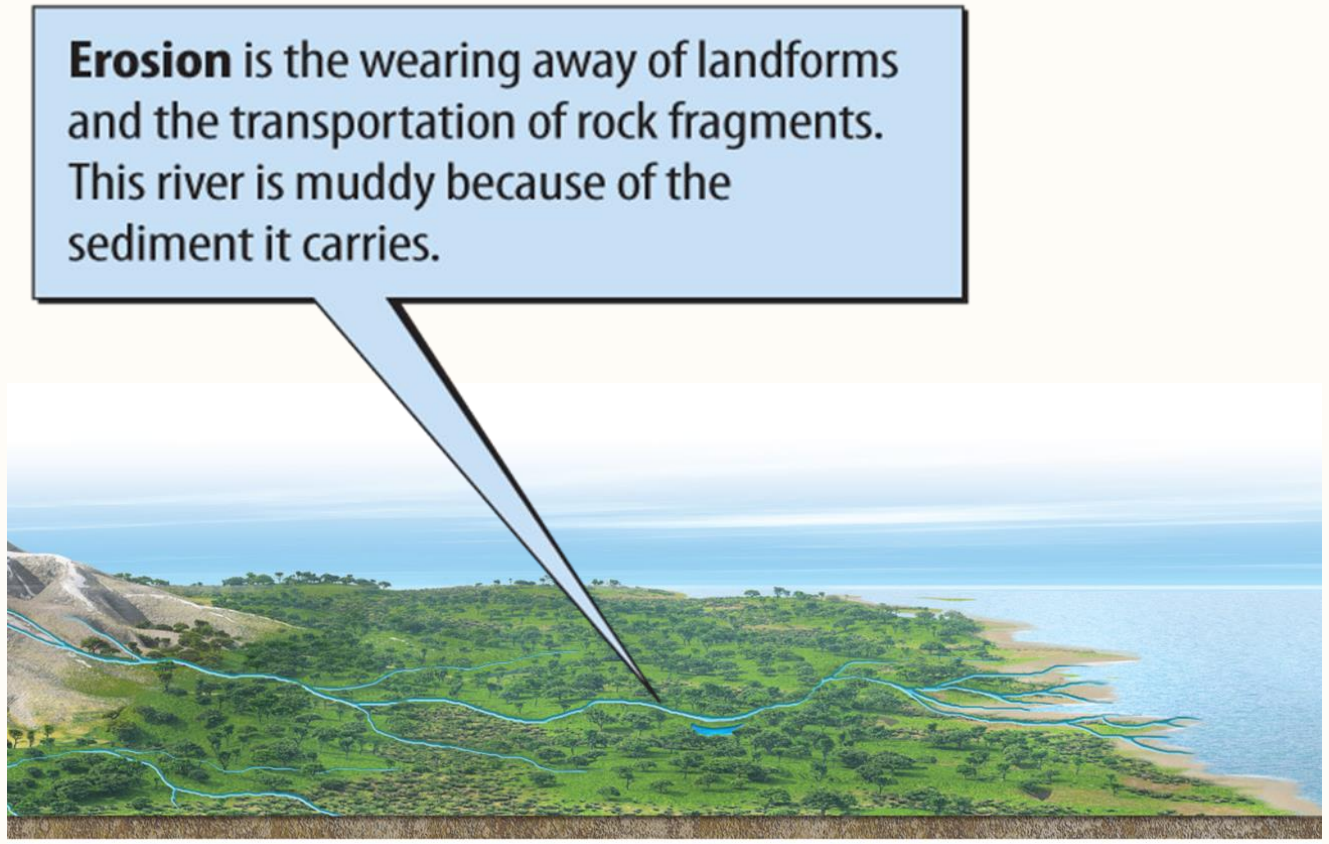
Weathering

- The breakdown of rock—weathering—is one type of destructive process that changes Earth's surface.
- Mechanical weathering is the breaking of rock into pieces, called sediment, without changing the chemical composition of the rock.
- Chemical weathering alters the chemical composition of rock.
- Water, wind, and ice are **agents**, or causes, of weathering.



Erosion

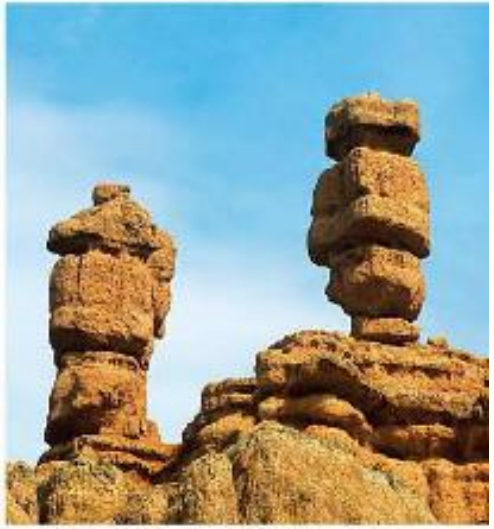
- Erosion is the removal of weathered material from one location to another.
- Agents of erosion include water, wind, glaciers, and gravity.



The Rate of Erosion

- Factors that affect the **rate of erosion** include weather, climate, shape of the land, and type of rock.
- The presence of **plants** and the way humans use the land affect the rate of erosion.
- The rate of erosion sometimes depends on the type of **rock.**
- Weathering breaks some types of rock into **large** pieces. Other rock types easily break into **smaller** pieces that are more easily transported.

Figure 2 Different rates of weathering of rock can produce unusual rock formations.



Rounding and Sorting

Figure 3 Erosion can change poorly rounded rocks (top) to well-rounded rocks (bottom).

- As rock fragments bump against each other during erosion, the shapes of the fragments can change.
- Erosion also affects the level of sorting—separating of items into groups according to one or more properties—of sediment.
- Sediment is often well-sorted when it has been moved a lot by wind or waves.
- Poorly sorted sediment often results from rapid transportation, perhaps by a storm, a flash flood, or a volcanic eruption.

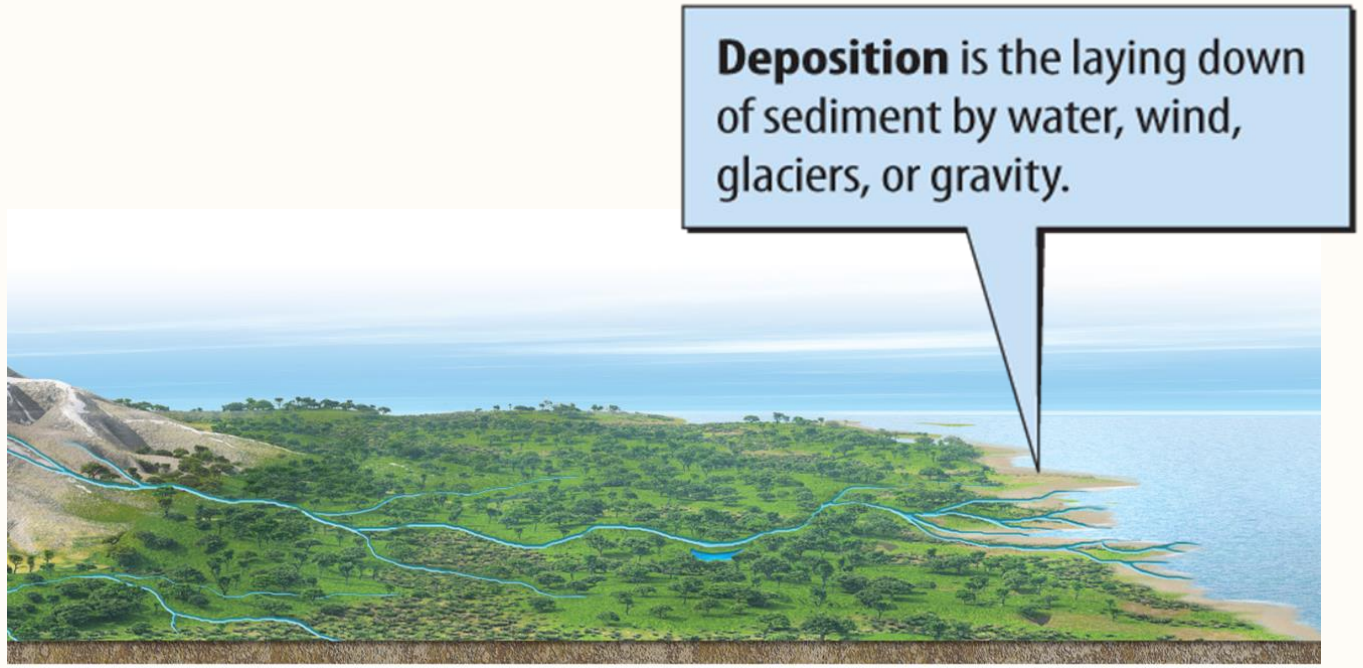
Poorly sorted sediment has a wide range of sizes.

Moderately sorted sediment has a small range of sizes.

Well-sorted sediment is all about the same size.

Deposition

- Deposition is the laying down or settling of eroded material.
- As water or wind slows down, it has less energy and can hold less sediment, which can result in some of the sediment being deposited.
- Sediment is deposited in locations called depositional environments, such as swamps, deltas, beaches, and the ocean floor.



Depositional Environments

- High-energy environments, like rushing rivers and ocean shores with large waves, are those in which sediment is transported and deposited quickly.
- Small grains of sediment are often deposited in low-energy environments, like deep lakes, areas of slow-moving air, and swamps.
- Sediment deposited in water typically forms layers called beds.
- Why might layered beds form when sediment is deposited?

- Have you ever seen a landform formed by erosion or deposition in person?

Interpreting Landforms

Landforms Created by Erosion and Deposition

Objectives

Students will be able to:

- Describe features of landforms created by erosion or deposition.
- Identify landforms as being created by erosion or deposition.
- Explain why deposition could not occur without erosion.

Sea Stacks

Many intriguing landforms are found along coastlines. These rocky towers are called sea stacks.

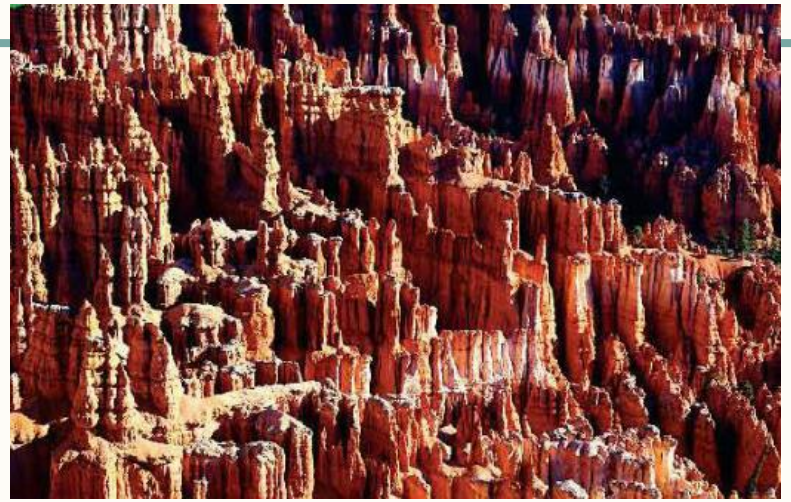
1. What clues in the photo suggest that the sea stacks were once connected to the cliffs on shore?
2. What forces might have affected the coastline during the past several thousands of years?

Landforms Formed by Erosion

- Landforms can have features that are clearly produced by erosion.
- Landforms produced by **erosion** are often tall, jagged structures with several exposed layers of rock.
- In Florida, coastal erosion changes the size and shape of **beaches**.
- The Tepees in the Painted Desert of Arizona were formed after erosion wore away parts of the land, leaving behind multicolored mounds.
- Why are the tepees worn to a point?

Different Rates of Erosion

- Different rates of erosion can result in unusual landforms when some rocks erode and more erosion-resistant rocks are left behind.
- Over time, wind and ice eroded the less resistant sedimentary rock, forming the hoodoos at Bryce Canyon National Park.
- Why do some types of rock erode more quickly than others?
- If a mountain is made of only one type of rock could it still be eroded?



Landforms Created by Deposition

- Landforms created by **deposition** are often flat and low-lying.
- For example, wind deposition can gradually form deserts of sand.
- Deposition also occurs where mountain streams reach the gentle slopes of wide, flat valleys.
- An apron of sediment, called an **alluvial fan**, often forms where a stream flows from a steep, narrow canyon onto a flat plain at the foot of a mountain.

- Why wouldn't an alluvial fan form at the point where a stream on a gently sloping hill moves onto a flat plain?

Landforms Created by Deposition

- In a river, an increase in channel width or depth can slow the current and promote deposition.
- Deposition along a riverbed occurs where the speed of the water slows down and can result in a **sandbar**.
- The endpoint for most rivers is where they reach a lake or an ocean and deposit sediment under water.

- Would you expect to see little sediment or much sediment at the endpoint of a wide, slow-moving river?
- What could you conclude about the amount of sediment in a slow-moving river that has no sandbars?

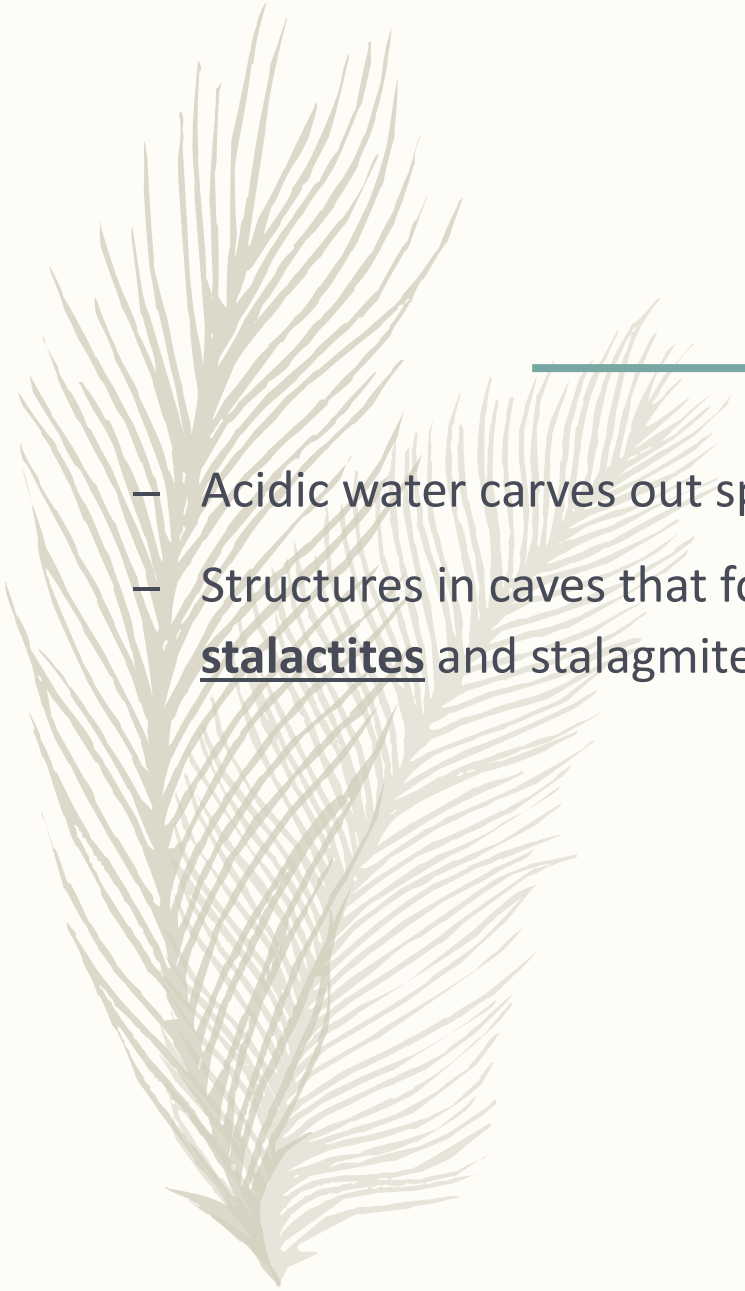
Glacial Erosion

- Glacial erosion also forms unique landforms.
- Glacial erosion produces ice-carved features in mountains, like jagged mountain peaks and u-shaped valleys, such as those in Glacier National Park.
- The sides of u-shaped valleys are steep and the bottom of the valley is very flat.
- If you visited this national park and then returned to the same place five years later, what kinds of changes are you likely to see on the second trip?

Fun fact: U-shaped valleys are likely to have rivers running through them. This could fool you into thinking that the river formed the valley. However, rivers form V-shaped valleys.

Landforms Created by Wind and Water

- **Water and wind** are important agents of weathering, erosion, and deposition.
- Currents and waves constantly cause **coastal** erosion.
- A **longshore** current moves sediment and changes the size and shape of beaches.
- **Coastal erosion can be due to waves, which carve out caves, pillars, and arches** in rock.



- Acidic water carves out spaces in underground rock, forming **caves**.
- Structures in caves that form by deposition from cave ceilings and floors are **stalactites** and stalagmites.

- A **delta** is a large deposit of sediment that forms where a stream enters a large body of water.
- **Abrasion** is the grinding away of rock or other surfaces as particles carried by wind, water, or ice scrape against them.
- A **dune** is a pile of windblown sand.

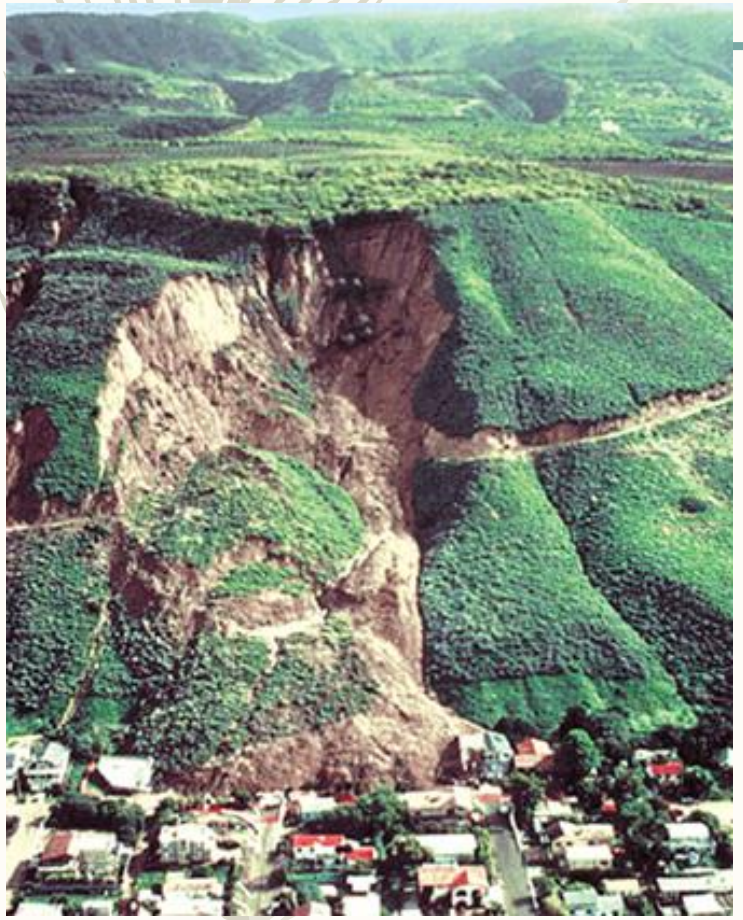
Mass Wasting

Erosion & Deposition

Objectives

Students will be able to:

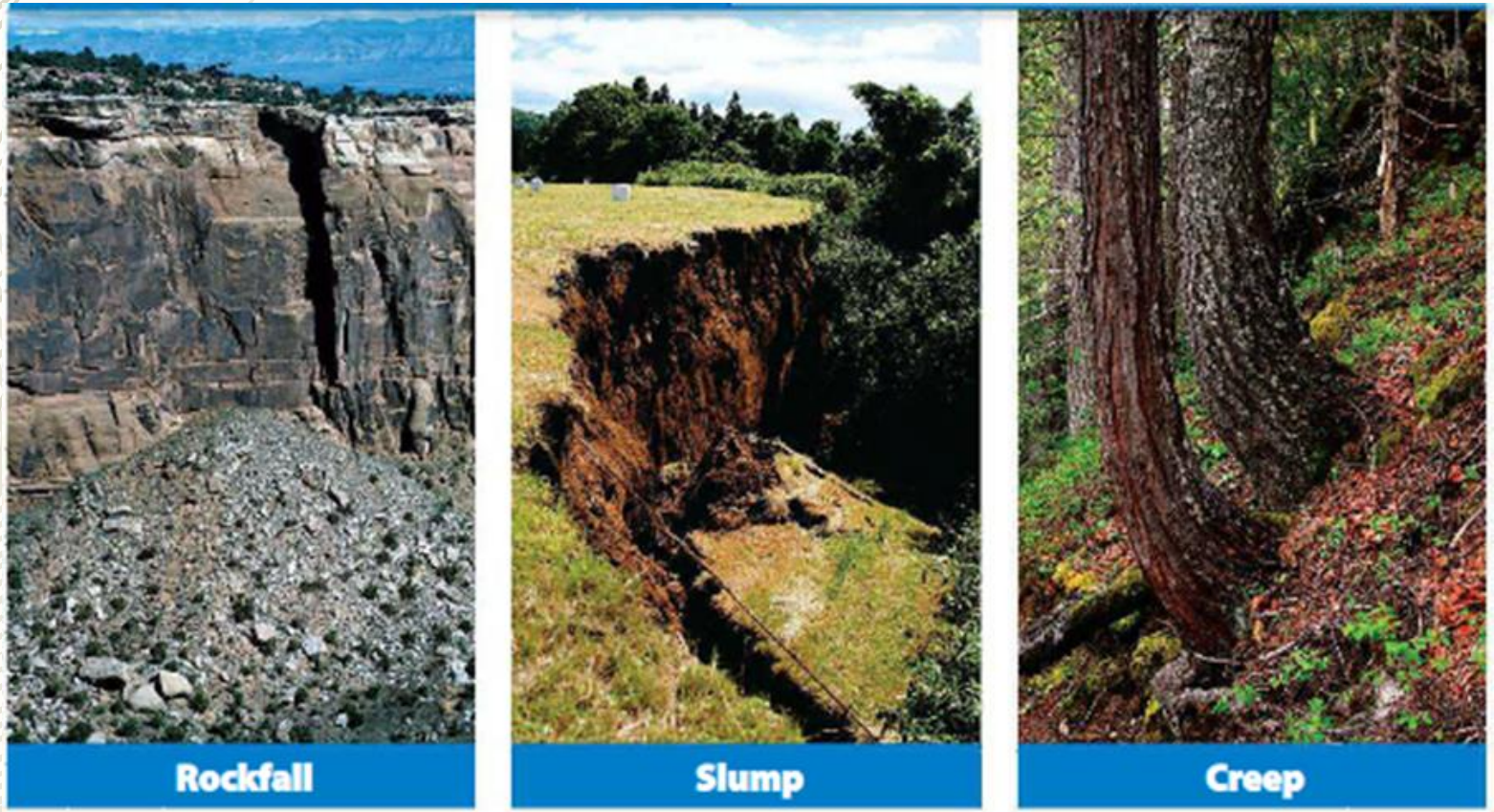
- Describe characteristics of a mass wasting event.
- Explain how human activities can affect the risk of mass wasting.



Not an Ordinary Day

March 4, 1995, began as an ordinary day in La Conchita, California. But at 2:03 PM the land on the bluff above the town began moving. Within a few minutes, ten houses were buried under huge piles of rock and dirt.
Landslides can be triggered by earthquakes, heavy rainfall, or human activities, Then the force of gravity takes over.

1. Examine the photo. What clues show that the land fell quickly and in large blocks?
2. What is meant by, “then the force of gravity takes over”?
3. What are some other ways that gravity can affect landforms?



How are these three types of erosion similar? How are they different?

Mass Wasting

- Mass wasting is the downhill movement of a large mass of rocks or soil.

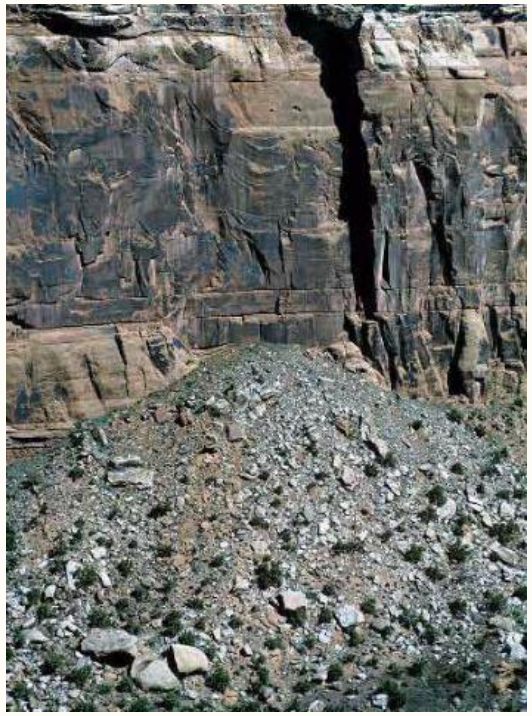
  Why do materials on a slope often move downhill?

- Mass wasting commonly occurs when soil on a hillside is soaked with rainwater.
- A landslide is the rapid downhill movement of soil, loose rocks, and boulders.

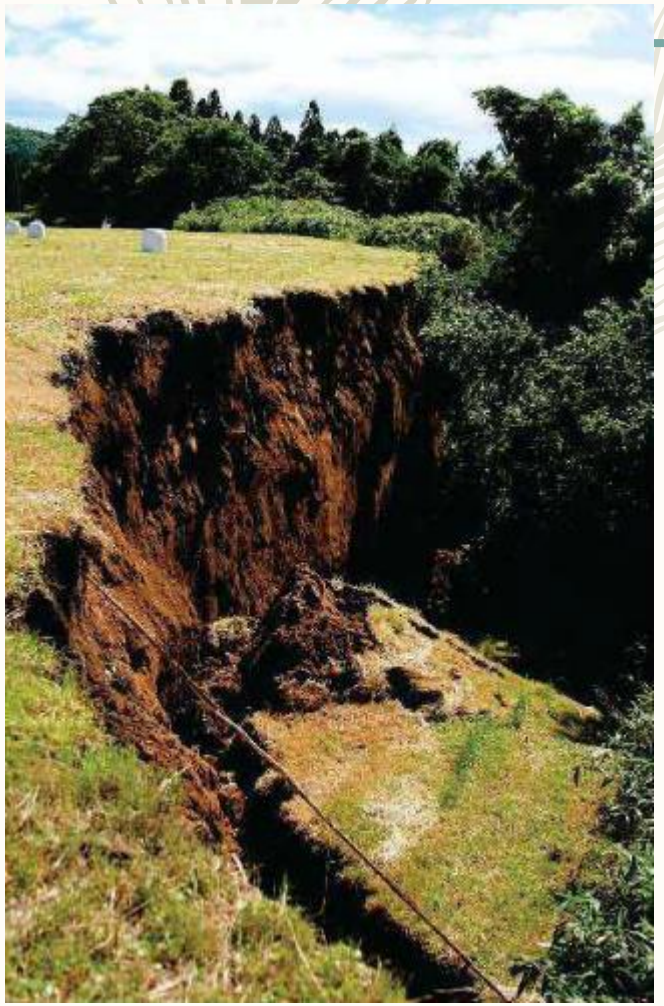
  Is a landslide that occurs during an earthquake an example of mass wasting?

- Two types of landslides are a rockfall and a mudslide.
- A mudslide occurs when water-soaked soil gets heavy.

  Why would the mass of the soil be a factor in mass wasting?



Slower Mass Wasting Events



- Slump is a type of mass wasting where the material moves slowly, in a large mass.
- If the material moves too slowly to be noticeable, causing trees and other objects to lean over, the event is called creep.
- Why is creep a type of mass wasting?

Talus

- When material reaches a stable location, such as the base of a mountain, the material is deposited.
- **Talus** is a pile of angular rocks and sediment from a rockfall.

Land Use Practices

- Human activity, such as removing **vegetation**, can affect both the severity of mass wasting and the tendency for it to occur.
- **Landscaping** or building on a slope can make the slope steeper and more likely to undergo mass wasting.